

U.S. Patent Application Serial No. 10/657,192
Amendment filed July 26, 2005
Reply to OA dated April 27, 2005

AMENDMENTS TO THE SPECIFICATION:

Amend the specification as follows:

Please replace the paragraph bridging pages 1 and 2 (line 20, page 1 through line 2, page 2), with the following rewritten paragraph:

In these processes, there are, for example, three types of ion guns that are used, which are classified according to a method for generating plasma therein. The representative types of ion guns are [[a FR]] an RF ion gun type in which RF (radio frequency) power is applied to generate plasma, a filament type in which plasma is generated by a hot filament, and a hollow cathode type in which DC power is applied to a hollow cathode.

Please replace the paragraph beginning at page 2, line 21, with the following rewritten paragraph:

[[A FR]] An RF ion gun 112 and an electron generator (a neutralizer) 113 are provided on the wall of the vacuum chamber 111. The RF ion gun 112 is connected to a power source 119 via a matching box 102.

Please replace the paragraph beginning at page 3, line 5, with the following rewritten paragraph:

Consequently, the electron generator 113 is started. When an ion beam 121 is emitted from the RF ion gun 112 with discharging electrons 122 from the electron generator 113, the electrons neutralize positive ions in the ion beam 121. Since neutral particles are applied to the target 115, atoms of the target 115 are sputtered as sputtered particles 123.

Please replace the paragraph bridging pages 5 and 6 (line 25, page 5 through line 13, page 6), with the following rewritten paragraph:

Furthermore, the present invention is a matching box having a high voltage side output terminal connected to a plasma generator, an input terminal connected to ~~[[a FR]]~~ an RF source, the matching box for changing a phase of current and/or a phase of voltage of RF power inputted into the input terminal and outputting phase-changed RF power to the high voltage side output terminal. The matching box further includes a first variable inductance element, wherein the first variable inductance element comprises a first main winding connected to the input terminal and the high voltage side output terminal, and a first control winding magnetically coupled to the first main winding, wherein an impedance of the first main winding is controlled based on a magnitude of direct current flowing through the first control winding.

Please replace the paragraph bridging pages 6 and 7 (line 23, page 6 through line 12, page 7), with the following rewritten paragraph:

The present invention is a matching box having a high voltage side output terminal connected to a plasma generator, an input terminal connected to ~~[[a FR]]~~ an RF source, a ground side output terminal connected to ground voltage, the matching box changing a phase of current and/or a phase of voltage of RF power inputted into the input terminal and outputting phase-changed RF power from the high voltage side output terminal, and the matching box further comprise a second variable inductance element. The second variable inductance element comprises a second main winding connected to the input terminal and the ground side output terminal, and a second control winding magnetically coupled to the second main winding, wherein the second main winding is controlled based on a magnitude of direct current flowing through the second control winding.

Please replace the paragraph beginning at page 12, line 13, with the following rewritten paragraph:

The plasma generator 12 of the vacuum apparatus 1 is ~~[[a FR]]~~ an RF ion gun having an ionization chamber 41. A coil 42 is wound around the ionization chamber 41. One end of the coil 42 is connected to the high voltage side output terminal 53 of the matching box 2, and the other end thereof is connected to the ground side output terminal 52. The ground side output terminal 52 is connected to ground via a fourth capacitor 37, described later, of the matching box 2.

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Please replace the paragraph bridging pages 14 and 15 (line 24, page 14 through line 1, page 15), with the following rewritten paragraph:

Neutralization generates neutral particles. When the neutral particles are irradiated to the target 15, atoms of the target 15 are sputtered as sputtered particles 23, and a thin film starts being formed on the surface of the substrate 17.